User Manual

SPI-P170

Hydrogen Peroxide

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Foreword:

The manual for the SPI-P170 is meant for the following authorized employees:

- Electrotechnical staff
- Watertechnical staff
- Laboratory staff

This manual is made for the installation and operation of the SPI-P170 Hydrogen Peroxide.

In this manual you will find various enumeration characters:

(-) Enumeration of functions
(1.) To be performed actions

- Please read this manual thoroughly
- Only let authorized staff work with the SPI-P170
- Make sure the manual is available for every user
- In case of emergency, please contact your supplier

Limited warranty
This manual is made with care, although SanEcoTec is not taking any responsibility according the consequential for any failures made in this manual.

1. Introduction

1.1 Purpose of the SPI-P170

The SPI-P170 is designed for correctly measuring, controlling, and guarding a water treatment process.

The SPI-P170 is suitable for the following sectors:
- Water companies
- Other locations that measure and regulate Hydrogen Peroxide levels

1.2 Important specifications

The most important specifications of the SPI-P170 are:
- Measuring the Hydrogen Peroxide level
- Measuring the pH level
- Measuring the flow
- Controlling the dosing pumps for Hydrogen Peroxide and acid
- Flow protection **(No flow, no dose)**
- Circulation contact protection
- A supply voltage of 12VDC

Specifications of the measurable parameters:
- Hydrogen Peroxide
  Method: peroxide color reagent
- pH
  Method: pH gel-electrode
- Flow
  Method: Via pulse or current sending flow meters like VDO or INEL (if your type isn't mentioned, please contact your supplier)

Measurement	Method	Range	Accuracy
Hydrogen peroxide	Peroxide color	0 -220 ppm	± 3 ppm
pH	Electrode	1 - 14 pH	± 0.05 pH
Flow	Pulse or Current	0 – 100 %	± 1%

The accuracies are based on strict adherence to the procedures in this manual.

1.3 Warnings

The SPI-P170 is designed and produced with the greatest care. However, you should take into account that:

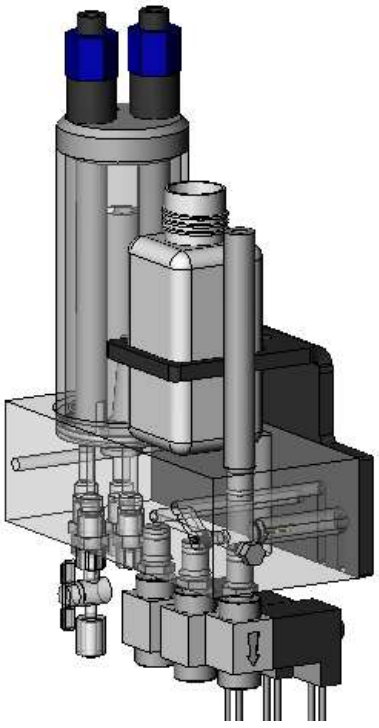
- The SPI-P170 makes use of dangerous and harmful chemicals.
- No higher supply voltage than 12VDC is used.

1.4 Background information

After years of collaboration with a team of specialists in the field of water treatment, the SPI measure and control system was introduced. The SPI-P170 is the fourth generation of its kind. The SPI-P170 is a water control system based on the colorimetric measuring method that utilizes peroxide reagent discoloration. The intensity of the discoloration after a measurement with the reagent is a measurement of the quantity of Hydrogen Peroxide in the water. The greatest advantage of colorimetric measuring is that it is not affected by external factors like pH and flow.

1.5 Conditions of use

- Surroundings free of aggressive vapours
- Temperature of the room housing the SPI-P170 is between 5°C - 40°C
- Relative humidity not > 80%
- No condensation



2. Description and operation

2.1 Description of the SPI-P170

The SPI-P170 is supplied and preassembled on one assembly plate provided with:

- 1 Control-unit
- 1 Analysis-unit

Dimensions (L x W x H) = 485 x 485 x 100 mm

All parts are installed either water technical or electro technical. See *figure 2.1.1.*

2.2 Operation of the SPI-P170

The sample water is fed into the buffer jar. The buffer serves, as the name implies, as a buffer from where the water can flow to the measuring cell. The surplus water will flow back to the buffer system. The SPI-P170 will run the measurements of the water within a freely adjustable time. See *figure 2.2.1.*
The measuring cycle of the SPI-P170 is as following:

- Empty cell of previous measurement
- Fill cell with the sample water and empty once more (rinse)
- Fill cell with to be measured water and start measuring the zero value and empty again
- Provide a shot of reagent, and fill the cell with a limited supply of water, measure the discoloration
- Fill the cell with some extra water and measure the discoloration again (2^{nd} measurement to check the saturation of the reagent, and to adapt the reagent valve time to save reagent), then empty cell
- Fill cell with the to be measured water and empty once more (rinse)
- Fill cell fully with water

The drain valve empties the cell after every step. That water exiting the cell is led to the sewer.

2.3 Software structure of the SPI-P170

The SPI-P170 makes use of simple operating software. The complete operation is executed using the buttons on the unit. The display shows measured values and settings. The hardware features an internal memory wherein data, reports, and calibration settings are stored. This data is available on demand and provided with a date and time of occurrence. When you have the optional SPI-REMOTE software, it is possible control and see the information of the SPI using the network or internet. With the optional SPI-GRAPHS software, you can use the data downloaded with the remote software, and use this for data acquisition.

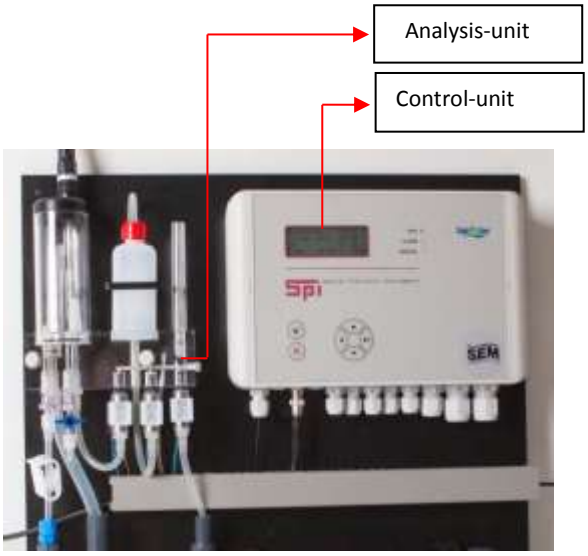


Figure 2.1.1.

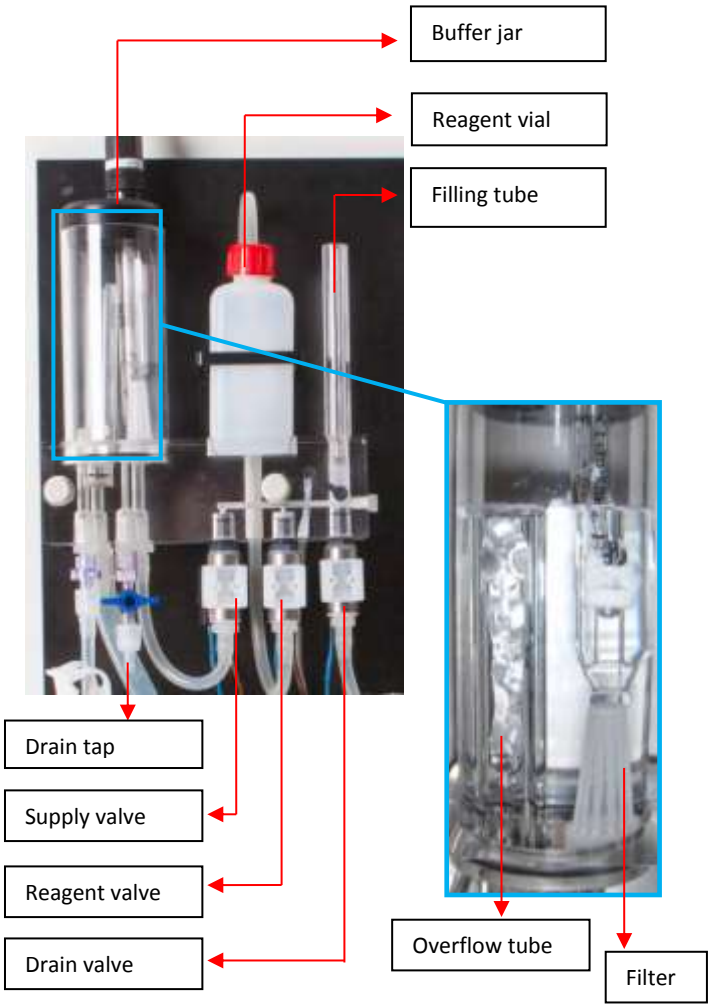


Figure. 2.2.1.

3. Safety

3.1 Safety regulations

The SPI-P170 is as careful as possible designed with the eye on safety. We tried to reduce the safety risks to a minimum.

- The SPI-unit is supplied with a 12VDC adapter via a power outlet.
- While the SPI-unit and the analysis-unit are placed next to each other, the water is not interfering with the electrical systems.
- Using the remote software (optional) you can use our services to provide assistance over distance

3.2 Risks

We would like to appoint the remaining risks. You need to handle these carefully by fully instructed and authorized staff:

- Refilling the reagent
- Cleaning spilled compound
- Store reagent in a cool, dark environment, provided with instructions.
- Keep the SPI-unit and the analysis-unit clean from any remaining reagent, because this will create stains with time.

3.3 Personal protective equipment

- Wear while in direct contact with the peroxide reagent safety glasses, latex gloves and protective clothing.

3.4 R-S sentences

- Peroxide color **R36/37/38**
  Harmful to the eyes, respiratory system and skin.

  R25
  Causes severe burns.

  S2
  Keep out of reach from children.

  S20
  Do not eat or drink.

  S24/25
  Avoid contact with the skin and eyes.

  S45
  In case of accidents, immediately seek professional help.

4. Transport and storage

4.1 Disassembly

To disassemble the SPI-P170, follow the following procedure:

1. Remove the adapter from the power outlet so that the unit is powerless.
2. Remove the reagent vial from the holder (watch out for spilling reagent from the tube).
3. Empty the reagent vial, and seal it with the cap.
4. Empty the buffer jar using the drain tap.
5. Remove possible pH electrodes and store these for later use (don't forget the protective cap with KCl-solution).
6. Flush the valves with clean water or when possible, distilled water. Do this by filling the buffer jar with this. Especially the reagent valve needs extensive cleaning. The reagent will cristalize when it dries. Do this by replacing the reagent vial with a container of clean water. Now control the valves a few times. See chapter *10.1.4.3 Times & test*, and for the reagent valve *chapter 10.1.4.2.*
7. Flush the analysis-unit well with clean water, then make sure the unit is empty and dry.
8. Clean all tubes with clean water and dry.
9. Remove all inserted cables from the SPI-unit.
10. Before the taking the assembly plate off the wall we point out once more that all parts should be dry.
11. Take the SPI-unit off the wall.

4.2 Transport

1. After disassembly, make sure the SPI-unit is placed in a firm box, with the components facing upwards. This may also be standing upward.
2. Protect the corners well from impacts.
3. Cover the upward facing components with filling or air foil.
4. Close the box with tape.
5. Make sure the box remains free from damage.

4.3 Storage

While storing make sure the environment meets the following requirements:

- Moisture free
- Free of corrosive vapours
- Temperature between 5°C - 40°C

5. Assembly and installation

The assembly and installation of the SPI-P170 is described in the following paragraphs. On the right side of the pages you'll find pictures or schemes that will clarify the text.

5.1 Assembly

The SPI-P170 consists of 2 main units:

- Control-unit
- Analysis-unit

See *figure 5.1.1.*

5.2 Installation

The SPI-P170 is completely preassembled on one assembly plate provided with the units as named in chapter 5.1.

Check prior to installation:

- The water supply is taken care of and brought to where the SPI is going to be
- The power outlet is in an acceptable range of the SPI-unit (100-240VAC 47-63Hz)
- The return to the buffer tank is taken care of and brought to where the SPI is going to be
- The drain to the sewer is taken care of and brought to where the SPI is going to be

Please follow the instructions for installing the SPI-P170:

1. Remove the SPI from the box.
2. Check if the cables are installed correctly in the cable glands
3. Mount the assembly plate to the wall.
4. Connect the water supply to the buffer jar, and provide enough flow (minimal 5 L/h).
5. Connect the return to the buffer tank to the buffer jar.
6. Connect the drain to the sewer to the buffer jar.
7. Connect the cables from the control unit as in *figure 5.2.1.*

- Supply: supplied adapter
- pH electrode
- Flow measurement 4-20 mA signal
- Flow measurement pulse signal
- Circulation contact
- Disinfection pump (Hydrogen Peroxide)
- Acid pump
- Supply water contact
- Alarm contact
- Cell contacts (LED and receiver)
- Valve contacts (supply, drain and reagent)

8. Place a vial of peroxide reagent in the holder, apply the cap, and insert the reagent tube through the cap.
9. The SPI-P170 can now be commissioned

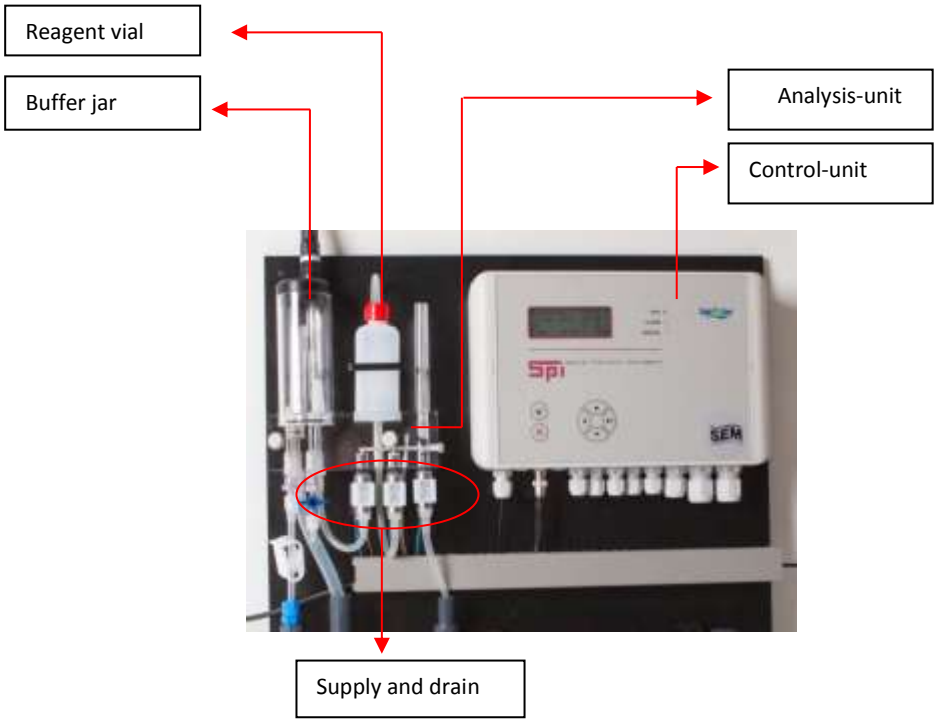


Figure 5.1.1.

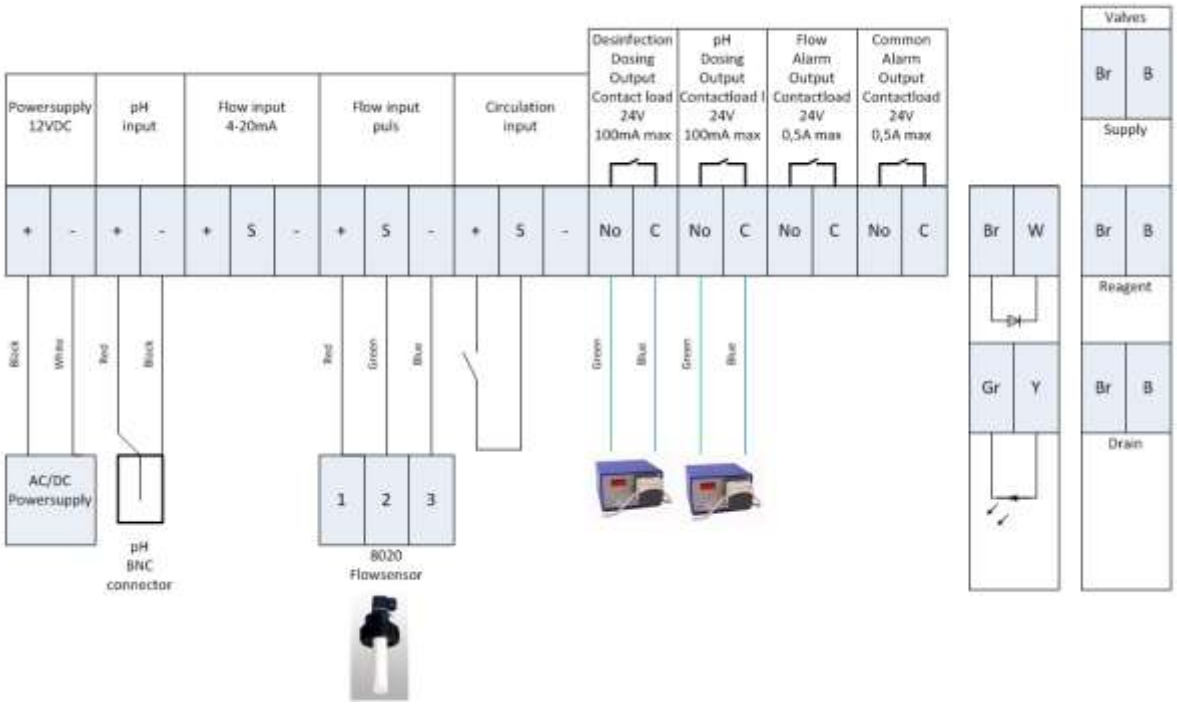


Figure 5.2.1.

6. Commissioning

6.1 Turning on the SPI-P170

The following procedures are to be followed to turn on the SPI-P170:

1. Put the 12 VDC adapter in the power outlet.
2. The boot screen appears on the display. The current software version is also displayed.

See *figure 6.1.1.*

6.2 Language choice

The SPI-P170 can be set to work with various languages. More about this can be found in chapter 15.4.

6.3 Indication LEDs

After the SPI-P170 has configured itself, the blue LED will start flashing.

On the front panel of the SPI-P170 control-unit are a total of 3 LEDs. The explanation of these LEDs are as following:

- Blue ON/OFF ; Working
- Red continued ; Alarm
- Red ON/OFF ; Turned off alarm
- Orange short ; Measuring
- Orange continuous ; Manual operation active

See *figure 6.3.1.*

! The images of the screens in this manual are for presentation and indication only. The shown values and settings may not be correct for your situation.

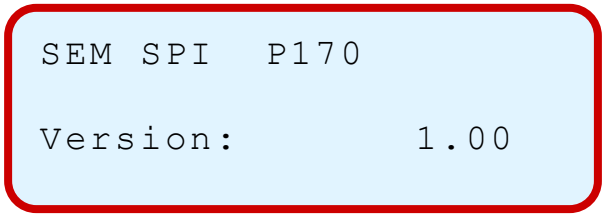


Figure 6.1.1.

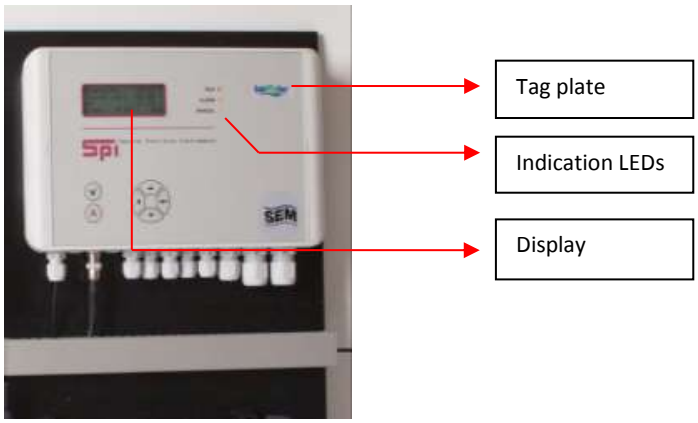


Figure 6.3.1.

7. Operation

7.1 Navigation

Using the keyboard, you can perform all operations. You simply follow the options through the menu structure on the display.

Navigating through the menu structure is done using the arrow buttons. The display displays a maximum of 4 lines a time. The menus often contain more information or possible choices. To display these, you can browse through using the arrow buttons.

- Page up with the arrow 'up' **(▲).**
- Page down with the arrow 'down' **(▼)**.
- Page back with the arrow 'left' **(◀)**.
- Confirming a selection with 'enter' **(↵)**.

Confirming is performed using the 'tick' **(✓)**. To go back the main menu, or cancel certain settings, you use the cross mark **(✕)**.
See *figure 7.1.1.*

! To return to the main menu after every step, press (✕).

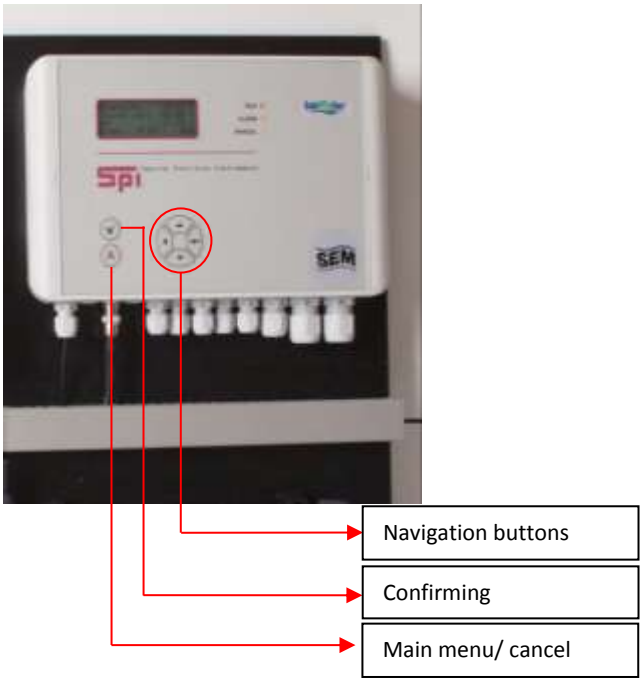


Figure 7.1.1

7.2 Selecting a choice

When you made a decision in the menu, you can select and enter this option by navigating the cursor to the correct line using the arrows. This cursor is always at the end of the sentence, and will flash. Most often, the indication that you can enter a next menu is done with the '**>**' symbol. When you select this symbol with the cursor and you press enter, you will go into this menu. Going back is always done with the left arrow **(◀)**.
See *figure 7.2.1.*

Figure 7.2.1.

7.3 Changing a value or setting

When a value or setting needs to be changed, and you press enter on that specific setting, a special menu appears. This menu displays the current setting, as well as the minimum and maximum settings this value can have.
With the cursor **(▓)** you select what digit to change, and you use the up and **(▲)** down buttons **(▼)** to modify the value. If you have made your choice, you press the tick **(✓)** button to confirm and safe. If you want to cancel and not safe the setting you press the cross **(✘)** button.
See *figure 7.3.1.*

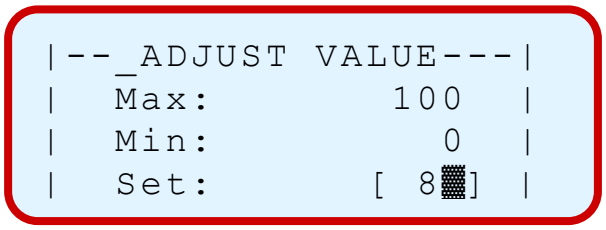


Figure 7.3.1.

8. Main menu

Using the main menu, all important functions of the SPI-P170 can be reached. The main menu is what you get to see after starting the SPI-P170, and is where you always get back to. The main menu consists of the following options:

- Overview – in this menu, the most important measurements and current alarms are displayed
- Calibration – in this menu you can calibrate specific measurements connected to the SPI-unit
- Settings – All kinds of settings to regulate the operation of the SPI
- Alarms – Gives a status of the current alarms that may or may not be active
- Manual operation – Here to possibility will be given to operate the SPI-P170 in automatic, semi-automatic or manual mode
- Reports – A variety of reports of specific functions and measurements
- Maintenance – The maintenance mode can be activated here
- Configuration – Important options concerning the hardware setup of the system and more

See *figure 8.1*.

The main menu is where you end up after pressing the cross **(✕)** button.

```
Overview          >
Calibration       >
Settings          >
Alarms            >
```

```
Manual operation  >
Reports           >
Maintenance       >
Configuration     >
```

Figure 8.1.

9. Overview

You can find the most important measurements and values and relevant information in the overview menu as in *figure 9.1*. You can enter this menu by selecting *Overview* from the main menu.

A special character is present behind some of the lines indicating its status. More about these characters can be read in chapter 12.1.

The lines respectively represent the following:

1. Current time and general alarm status
2. Current Hydrogen Peroxide value
3. Current pH value
4. Current Flow value (Dashes represent that no flow sensor has been installed, the alarm character is now 'X')
5. Current Hydrogen Peroxide pump control
6. Current acid pump control
7. Circulation status
8. The final line is able to show a possible alarm.

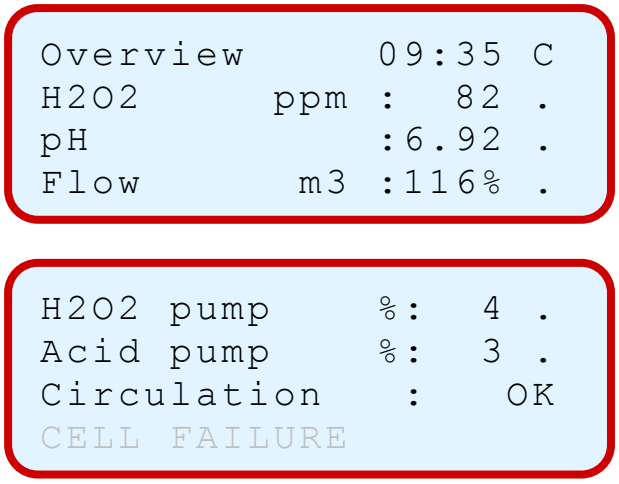


Figure 9.1

10.Calibration

All measurements connected to the SPI-P170 must be regularly checked and, if necessary, be calibrated. This ensures the quality of the measurements made. You can enter this menu by selecting *Calibration* from the main menu.

Calibrating the measurements is done by using calibrated third party equipment. The following measurements can be calibrated on the SPI-P170 Hydrogen Peroxide:

- Hydrogen Peroxide
- pH

See *figure 10.1.*

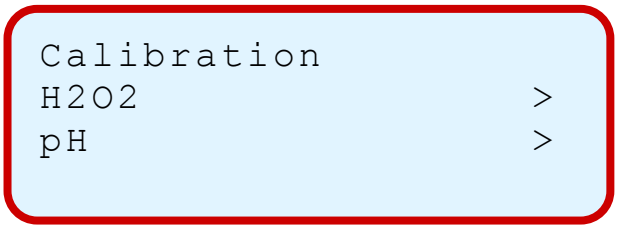


Figure 10.1.

10.1 Hydrogen Peroxide

At the procedure of calibrating Hydrogen Peroxide you are able to choose between 2 different methods of calibration:

- With handheld (a relatively fast method to calibrate Hydrogen Peroxide measurement using a handheld)
- With fluids (a method to calibrate the Hydrogen Peroxide measurement using professional calibration fluids)

Next to calibrating you can also choose for:

- Restore calibration (restores the calibration settings to the factory settings)
- Settings (various settings for controlling the valve times, checking the current cell values and refilling the reagent vial)

See *figure 10.1.1.*

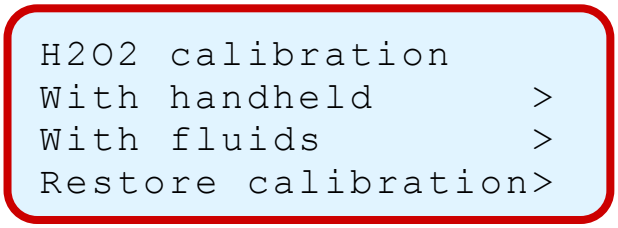


Figure 10.1.1.

10.1.1 Calibrating with handheld

When you select Calibrating *with handheld* the menu as in *figure 10.1.1.1* will appear. Here you can perform a calibration using a third party handheld. Now perform the following instructions:

1. Take a sample from the drain tap under the buffer jar and measure this with the handheld. Refer to the handheld's instructions here.
2. Compare the value of *Current* with the measurement of the handheld.
3. If there is a big difference between the current and metered values, press enter **(↵)**.
4. You now get to see the *Adjust Value* screen where you must enter the correct metered value at *Set*
5. Press the tick **(✓)** now.
6. The measurement has been calibrated.

! Start calibrating the measurement only after at least one measurement has been performed. Otherwise this could cause a wrong calibration.

```
Hand calibration
Current   :    69 ppm
Metered   :    65 ppm
Press (V)to save
```

Figure 10.1.1.1.

10.1.2 Calibration with fluids

Calibrating using fluids guarantees a more dependable calibration then when using a handheld. The system lets you first perform a zero point measurement, and after that a measurement using a control fluid of your choice. The measurement will then be calibrated at 2 points.

To calibrate with fluids, select
calibrating *with fluids,* the menu as in *figure 10.1.2.1* will appear.

```
Fluids calibration
Current   :    50 ppm
Cal at    :    52 ppm
Begin  0 ppm calib >
```

Figure 10.1.2.1

Follow the following steps to calibrate with fluids:

1. Make sure you have the correct control fluids and tools within reach. Here we will use a control fluid of 52 ppm.
2. Select the line *Cal at … ppm* and press enter . Fill **(↵)** in the value of your control fluid in ppm (particles per million), and confirm with the tick **(✓)**.
3. Now select *Begin 0 ppm* calibration and press enter **(↵)**. The menu of *figure 10.1.2.2* now appears.

```
Calibration at 0 ppm
Expect : 980-1015 mV
Actual :      964 mV
Begin 52 ppm calib >
```

```
Supply valve       >
Drain valve        >
Color valve        >
Remeasure          >
```

Figure 10.1.2.2.

4. When you scroll down you have free use of the valves. Just select and press enter **(↵)**. Use the supply valve to fill the cell with water.
5. Now select *Remeasure* and press enter **(↵)**. The actual *value* now needs to show between 980 and 1015 millivolt (mV).

6. If the *value* is correct, select and press enter **(↵)** on *Begin 52 ppm calib*. The menu of *figure 10.1.2.3* now appears.

```
Cal at 52 ppm
Value   :   51  ppm
Expected:   52  ppm
Press(V)to save
```

Figure 10.1.2.3.

```
Supply valve        >
Drain valve         >
Color valve         >
Remeasure           >
```

7. Rinse the cell a few times by alternating the use of the supply valve and the drain valve.
8. Fill the cell with your chosen control fluid. You can either simply pour it gently in the filling tube, or injecting it with a tool.
9. Now select *Remeasure* and press enter **(↵)**.The cell will now start measuring the control fluid. The *value* needs to show a result close to 52 ppm. If this is not the case, try to recalibrate again. Otherwise, select *Press (V) to save,* and press the tick **(✓)** to save the calibration.
10. The measurement is now calibrated.

! Start calibrating the measurement only after at least one measurement has been performed. Otherwise this could cause a wrong calibration.

10.1.3 Reset Calibration

If you are not satisfied with the current Hydrogen Peroxide calibration or you don't have the right tools to calibrate, you can reset the calibration settings to the factory settings. To do a calibration reset, select *Restore calibration* from the Hydrogen Peroxide calibration menu. The screen from *figure 10.1.3.1* will now appear.

Reset calibration
To perform a restore, press the tick **(✓)** while in this screen, the Hydrogen Peroxide calibration will then be restored to its factory settings.

! After restoring the calibration to its factory settings, it is important to check the calibration as soon as possible.

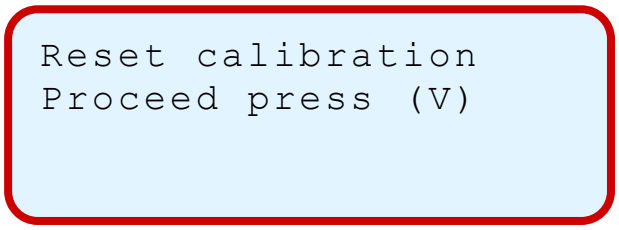


Figure 10.1.3.1.

10.1.4 Settings

When you select *Settings* from the Hydrogen Peroxide calibration menu, the menu as in *figure 10.1.4.1* will appear. In this menu are a few advanced options and settings for the Hydrogen Peroxide calibration. You can make a choice out of the following options:

- *Cell values* (gives a quick overview of the current cell values)
- *Color empty* (when the vial of peroxide reagent is empty or near empty, this menu helps you replace it)
- *Timing & test* (You will be able to test and control the valve times in this menu)

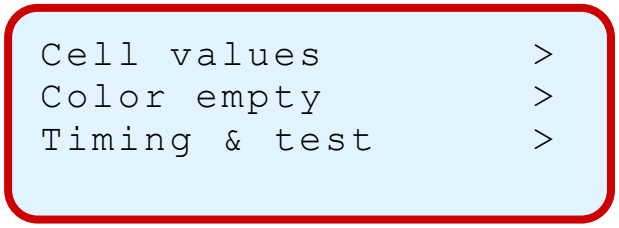


Figure 10.1.4.1.

10.1.4.1 Cell values

When you select *Cell values* from the Hydrogen Peroxide settings menu, the menu as in *figure 10.1.4.1.1* will appear. In this menu it is possible to check the current cell values:

1. Cell null: the zero value of the measuring water without peroxide color.
2. Cell active: the value of the measuring water with the peroxide color added.
3. Cell 2^{e} ctrl: The value of the measuring water with the peroxide color added, plus a little more measuring water added.
4. Color time: the current opening time for one shot of peroxide color reagent.

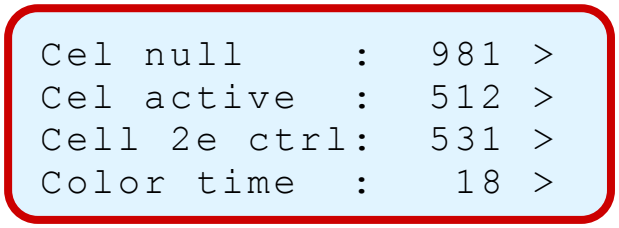


Figure 10.1.4.1.1.

10.1.4.2 Resupply reagent

When you select *Color empty* from the Hydrogen Peroxide settings menu, the menu as in *figure 10.1.4.2.1* will appear. In this menu it is possible to replace the vial of peroxide reagent. The cell is preparing itself for replacing the vial now.
To avoid air bubbles in the reagent supply tube to the analysis-unit, the reagent first has to be guided through the tube before use.

! Prior to replacing the vial, check if the supply tube is completely filled with peroxide reagent. If this is the case, you can skip the steps mentioned underneath, and simply switch the vial, and stick the tube back in

If the supply tube is dry because it is for example just out of storage, the following steps need to be taken:

1. Take out the tube of the old vial, and take the vial out of its holder. Check if there is still some reagent left, you can reuse this.
2. Take a new vial and place it in the designated holder on top of the analysis-unit.
3. Replace the standard cap of the vial and replace this with the cap supplied with the SPI-P170. This cap contains 2 holes; one for the tube, the other for aeration.
4. Insert the supply tube through the hole in the cap; make sure the end of the tube reaches the bottom of the vial.

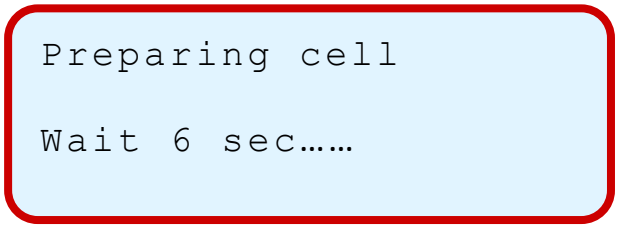


Figure 10.1.4.2.1.

5. By now the menu as in *figure 10.1.4.2.2* has appeared. The cell is prepared.

```
Put your finger on
top of tube.
Press (V)
```

Figure 10.1.4.2.2.

6. You are asked to place your finger on the top of the filling tube. Do this and ensure an airtight seal. See *figure 10.1.4.2.3.*

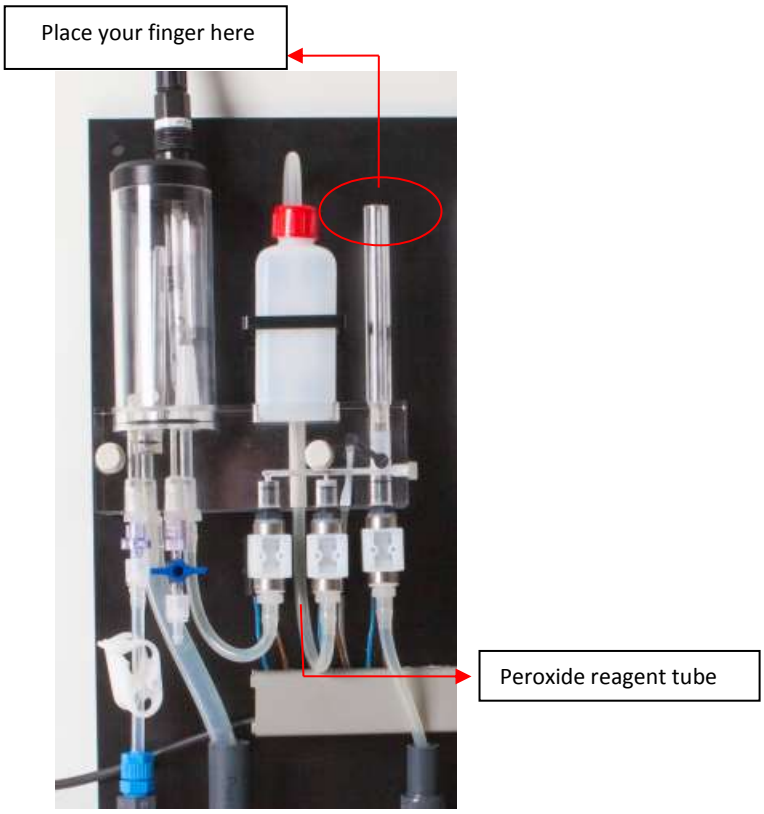


Figure 10.1.4.2.3.

7. Now press the tick **(✓)**. Button. The color valve and the drain valve will open now. Because of the pressure difference, the peroxide color will be sucked down to the cell. The tube is now free of air.

! Warning! Hydrogen Peroxide peroxide reagent contains a strong acid. Make sure you have the right tools and protection. Clean up spills directly and work preferably with gloves.

! It is advised when replacing the enmpty reagent vial with a new one, to clean the cell with a cotton swab. Remove the filling tube temporarily (when there's no fluids in the tube remaining), moisten the swab lightly with clean water, and clean the cell. Then start replacing the reagent vial like normal. This keeps the cell in condition.

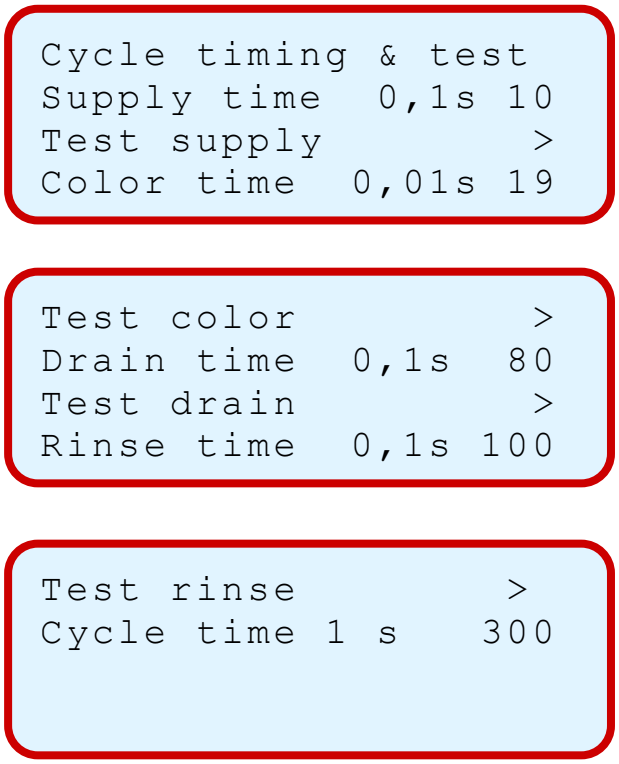
10.1.4.3 Timing & testing

When you select *Timing & test* from the Hydrogen Peroxide settings menu, the menu as in *figure 10.1.4.3.1* will appear. In this menu it is possible to change the times that the valves will be open to supply water, reagent, or drain.

The following functions can be performed here:

- *Supply time* (the time the supply valve will be opened in tenths of a second. Setting this as 10 means an opening time of 1 second.)
- *Test supply* (tests the water supply valve with the above set time)
- *Color time* (the time the color valve will be opened in hundreds of a second. Settings this as 19, means an opening of 0,19 second. **Setting as 0, means automatic reagent dosing**)
- *Test color* (tests the color supply with the above set time)
- *Drain time* (the time the drain valve will be opened in tenths of a second. Setting this at 100, means an opening of 10 seconds)
- *Test drain* (tests the drain valve with the above set time)
- *Rinse time* (the time the supply valve will fill the cell and the filling tube in seconds. Setting this at 100, means a rinse time of 10 seconds)
- *Test rinse* (tests the rinse time with the above set time)
- *Cycle time* (The time the SPI-P170 will 'wait' between 2 measurements in seconds. Setting this at 300, means that the SPI will wait 5 minutes, before the next measurement starts.

! If the color valve time is set at 0, the automatic peroxide reagent dosing is activated. This means that the dosing of a shot of peroxide color will be adapted to the use of the reagent. This saves peroxide reagent.



Figuur 10.1.4.3.1.

! The cycle time is responsible for the quantity of measurements. A low time here means more measurements, but also more peroxide color use. More time means fewer measurements, but it saves more peroxide color.

! The SPI-P170 will temporary stop measuring and controlling as long as this menu is opened. The pumps will remain pumping at the same level as before this menu was opened. Therefore, close this menu when ready with the timing settings.

10.2 pH

When you select *pH* from the calibration menu, the menu as in *figure 10.2.1* will appear. In this menu it is possible to calibrate the pH.

For calibrating the pH value, it is important to have the right tools at hand. The pH is calibrated using 2 independent constant buffer solutions with different pH values. Make sure you have these solutions with you before starting the calibration.

To check the pH measurement, we advise to have a well calibrated third party handheld with its own pH electrode. A colorimetric comparison like the phenol-red solution is only an indication, not an absolute value

```
pH calibration
Cal.  pH 7 at   7.00
Start pH 7 calibr. >
Cal. pH 4 at    4.01
```

```
Start pH 4 calibr. >
Reset pH calibr.   >
Water temp. C     25
```

Figure 10.2.1.

Take the following steps in order to calibrate the pH:

1. Make sure the pH fluids are at the right temperature
2. Select *Calibrate pH 7 at 7.00* and press enter **(↵)**. Either fill in your choice of buffer solution, or leave this unchanged at 7.00. Confirm with **(✓)**.
3. Take the electrode out of the buffer jar and flush it with clean water.
4. Now select *Start pH 7 calibration* and press enter **(↵)**.
5. The top screen as in *figure 10.2.2* appears. Take your pH electrode and put it in the pH solution of your choice.

```
pH 7.00 calibration
Probe  Hz     :  1500
Actual pH     :  7.01
Press (V)to save
```

```
pH 4.01 calibration
Probe Hz      :   654
Actual pH     :  3.99
Press (V)to save
```

Figure 10.2.2.

6. Gently stir the electrode through the solution for about a minute.
7. Check the value at *Actual pH*. Wait for this value to get stable, then confirm with **(✓)**.
8. Now flush the electrode with clean water.
9. Execute steps 2 -8 with the pH 4.01 calibration (or your own calibration).
10. The pH is now calibrated at 2 points.
11. As final confirmation, we advise to flush the electrode once more, and to put it in the pH 7.00 solution.
12. Press **(✗)**, and select *Overview*. Check if the pH is now at 7.00 or very close.
13. Flush the electrode once more, and place it in the buffer jar.

11 Settings

In the settings menu it is possible to change the settings of specific parts of the SPI-P170. You can enter this menu by selecting *Settings* from the main menu. You can choose between the following submenus:

- H_2O_2
- pH
- Flow
- Time & date
- Day/night
- Clean filter syst.

See *figure 11.1.*

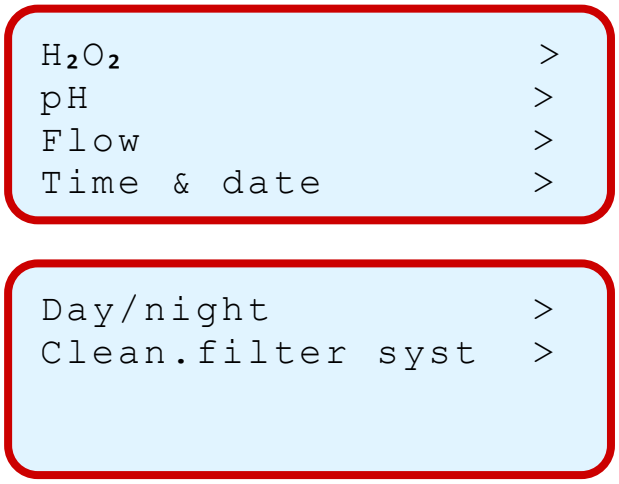


Figure 11.1.

11.1 Hydrogen Peroxide settings

When you chose for *Hydrogen* settings in the previous menu, you'll see the screen as in *figure 11.1.1.* Here you can view or change the following settings:

- *Hi alarm day* (when the Hydrogen Peroxide measurement exceeds this value in the day hours, an alarm will be given)
- *Hi alarm night* (when the Hydrogen Peroxide measurement exceeds this value in the night hours, an alarm will be given)
- *Setpoint day* (The setpoint of the Hydrogen Peroxide measurement in the dayhours)
- *Setpoint night* (The setpoint of the Hydrogen Peroxide measurement in the dayhours)
- *Lo alarm day* (when the Hydrogen Peroxide measurement undershoots this value in the dayhours, an alarm will be given)
- *Lo alarm night* (when the Hydrogen Peroxide measurement undershoots this value in the nighthours, an alarm will be given)
- *Critical alarm* (when the Hydrogen Peroxide value undershoots this setting, a critical alarm is given, and the pump stops dosing. Something must be very wrong at this point and you should check your installation)

```
Hydrogen settings
Hi alarm day   : 120
Hi alarm night : 120
Setpoint day   :  80
```

```
Setpoint night :  80
Lo alarm day   :  10
Lo alarm night :  10
Critical alarm :   5
```

```
Alarm del day  :1200
Delta %        :  50
Prop factor    : 3.0
Int factor s   : 200
```

```
Pump min %     :   0
Pump max %     :  80
Max pulse time :1800
```

Figure 11.1.1.

- *Alarm del day* (The delay in seconds after an alarm will be given. A too short time may cause false alarms when there is a bad measuring present)
- *Delta* (this setting controls the maximum and minimum pump setting. The SPI-P170 calculates the average pump control. The pump cannot go over xx% of this average value)
- *Prop factor* (his setting controls the proportional gain of the Hydrogen Peroxide controller system. The SPI-P170 constantly calculates the difference between the setpoint and the actual Hydrogen Peroxide value. The more difference the harder or slower the pump will go. The factor filled in here is the amount of amplification of the gain. The proportional factor is engaging with the integration time)
- *Int factor s* (this setting controls the integration time of the Hydrogen Peroxide controller system. The integration time adds or subtracts a percentage of the pump's control every time the set time has expired. The integration factor is only working when the set point differs from the measured value. This setting is used for slowly reaching the desired set point, when the proportional gain is not responding all that much)
- *Pump min %* (the minimum percentage at which the pump will work)
- *Pump max %* (the maximum percentage at which the pump will work)
- *Max pulse time* (the maximum time at which the pump can pump on maximum setting. If after this time the pump is fully pumping, and the measured value still has not reached the desired set point, there must be something wrong)

! Delta, proportional gain, and integration time are advanced settings. They affect the control system and how efficient a specific system is controlled.

11.2 pH settings

When you chose for *pH* settings in the settings menu, you'll see the screen as in *figure 11.2.1.* Here you can view or change the following settings:

- *Hi alarm day* (when the pH measurement goes over this value in the dayhours, an alarm will be given)
- *Hi alarm night*(when the pH measurement goes over this value in the nighthours, an alarm will be given)
- *Set point day* (The set point of the pH measurement in the dayhours.
- *Set point night* (The set point of the pH reading in the
- *Lo alarm day* (when the pH measurement drops under this value in the dayhours, an alarm will be given)
- *Lo alarm night* (when the pH measurement drops under this value in the nighthours, an alarm will be given)
- *Alarm Del day* (The delay in seconds after an alarm will be given. A too short time may cause false alarms when there is a bad reading present)
- *Delta* (this setting controls the maximum and minimum pump setting. The SPI-P170 calculates the average pump control. The pump cannot go over xx% of this average value)
- *Prop factor* (his setting controls the proportional gain of the pH controller system. The SPI-P170 constantly calculates the difference between the setpoint and the actual pH value. The more difference, the faster or slower the pump will work. The set factor here is the amount of amplification of the gain. The proportional factor is engaging with the integration time)
- *Int factor s* (this setting controls the integration time of the pH controller system. The integration time adds or subtracts a percentage of the pump's control every time the set time has expired. The integration factor is only working when the setpoint differs from the measured value. This setting is used for slowly reaching the desired setpoint, when the proportional gain is not responding all that much)
- *Pump min %* (the minimum percentage at which the pump will work)

```
pH settings
Hi alarm day   : 7.50
Hi alarm night: 7.50
Setpoint day   : 6.80
```

```
Setpoint night: 6.80
Lo alarm day   : 6.00
Lo alarm night: 6.00
Alarm del day : 1200
```

```
Delta %         :  50
Prop factor     : 1.0
Int factor s    : 180
Pump min %      :   0
```

Figure 11.2.1.

- P*ump max %* (the maximum percentage at which the pump will work)
- *Max pulse time* (the maximum time at which the pump can pump on maximum setting. If after this time the pump is fully pumping, and the measured value still has not reached the desired setpoint, there must be something wrong)

```
Pump max %      :  80
Max pulse time :1200
```

! Delta, prop factor, and int factor are advanced settings. They affect the control system and how efficient a specific water is controlled.

11.3 Flow settings

When you chose for *Flow* settings in the settings menu, you'll see the screen as in *figure 11.3.1.* Here you can view or change the following settings:

- *Alarm %* (when the flow falls below this value, an alarm will be given)
- *Alarm delay sec* (the delay in seconds after which an alarm will be given)
- *Dose stop %* (when the flow falls below this value, the acid pump will stop dosing, something must be wrong)
- *Dose stop delay* (the delay in seconds before the acid pump will stop pumping after the dose stop error)

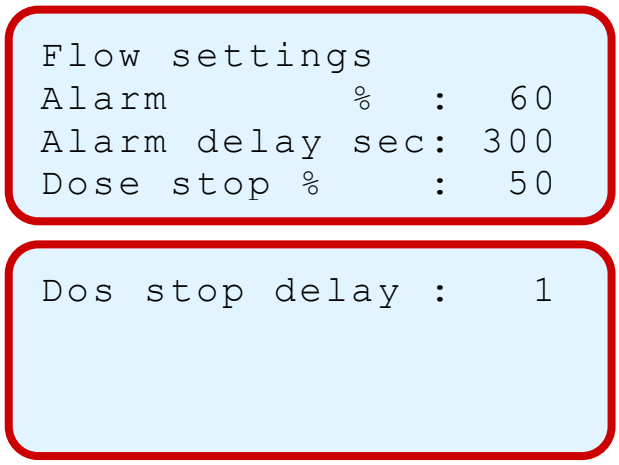


Figure 11.3.1

11.3.1 Advanced flow settings

Flowsensors are sensors that send out voltage pulses or a current. The frequency in Hertz (Hz) of those pulses, or the amount of current (mA) is proportional with the flow. You can fill in the correct value in the *System setup* of the *Configuration* menu.
When you have a flowsensor that uses pulse signals, you need to fill in the maximum amount of m3/h at 50Hz in the *m3/h at 50Hz* option in chapter 16.1. When you have a flowsensor that uses current signals, you need to fill in the maximum amount of m3/h at 20mA in the *m3/h at 20mA* option in chapter 16.1

Next, you need to fill in the amount of cubic litres of water each hour when the flow should be at 100% in the *m3/h at 100%* option in chapter 16.1. This information should be in the design plans you got supplied with your system by the installer.

Example calculating pulse sending sensors
When the flowmeter is sending pulses, the flow in m3/h at a sensor frequency of 50Hz is to be calculated as below:

$F = 0{,}004875 \times D^2$ (VDO flowsensor)
$F = 0{,}003140 \times D^2$ (INEL flowsensor)

Wherein:
F = the flow at a sensor frequency of 50Hz in m3/h.
D = the internal diameter of the tube the flowsensor is installed in, in mm

Example calculating current sending sensors
When the flowmeter is sending current, the flow in m3/h at a maximum output of 20mA is to be calculated using the supplied information with the sensor.

Example: Bürkert sensor type 8020
30Hz corresponds to 1m/s. Tube diameter 50mm, fill in the number 6 at (m3/h bij 30Hz).

Diameter	Flow m^3/h (at v=1m/s)
50	6
63	10
75	14
90	19
110	29
125	37
140	47
160	61
200	96
225	121
250	150

11.4 Time & date settings

When you chose for *Time & date* settings in the settings menu, you'll see the screen as in *figure 11.4.1.*

Setting the right time is important, because the correct operation of the SPI-P170 is dependable on this setting. If the date or time settings are not correct, the system could be able to load different day/night settings at the wrong moments. The date and notes that would be written in the reports and logs would be wrong too.

Here you can view or change the following settings:

- *Minutes* (the minutes of the current time)
- *Hour* (the hours of the current time)
- *Day* (the days of the current date)
- *Month* (the months of the current date)
- *Year* (the years of the current date)

It could happen that the SPI-P170 has reset the date & time settings at a power failure. If this is the case, the SPI will start counting from it's default date and time values. The cause of this is most likely a bad battery. Contact the supplier if you suspect this.

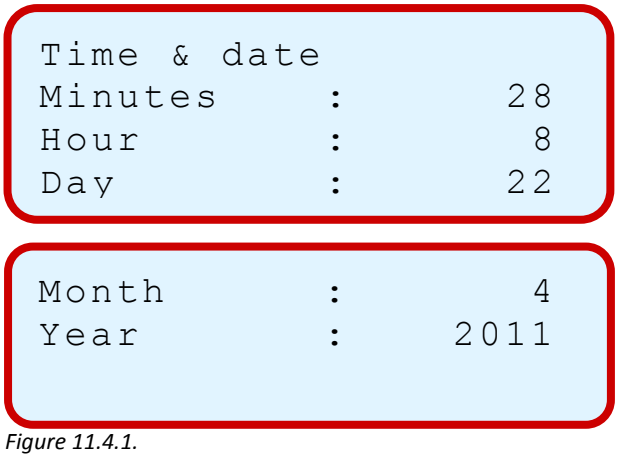


Figure 11.4.1.

11.5 Day/night settings

When you chose for *Day/night* settings in the settings menu, you'll see the screen as in *figure 11.5.1.*

```
Day hour        :   7
Day minute      :   0
Night hour      :  21
Night minute    :   0
```

Figure 11.5.1.

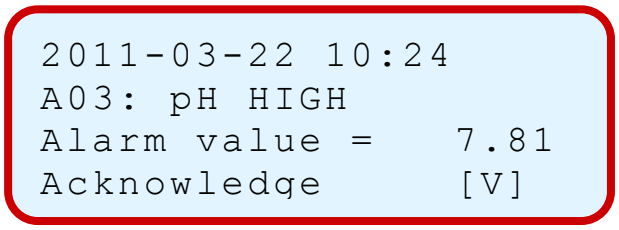
These settings make different settings for day/night times of the system possible. For example, at night, you could set a lower value for the Hydrogen Peroxide setpoint You can find these settings in the Hydrogen Peroxide or pH settings as explained in chapter *11.1* and *11.2*.

12.Alarms

All current alarms and their alarm values will be shown in the *Alarms* menu. If an alarm has presented itself, the red LED will light on the keypad of the SPI-P170. You can enter this menu by selecting *Alarms* from the main menu.
When you select alarms, the screen as *figure 12.1* will appear.

The alarms will be shown in the following format:

1. The date and time of the event.
2. The alarm code and the description.
3. The value at which the alarm went off



Figuur 12.1.

12.1 Alarmcodes and characters

Depending on each alarm, action will be taken. The alarms come with a code. These alarmcodes and how to solve them can be seen in chapter 12.3

During an alarm situation it can occur that an alarm will not be directly given. This is possible by setting alarm delays. When a measurement returns back to a non-alarm state, the alarm will void. You can read these alarms back in the alarm reports. For this we link you to chapter 14.

If you start fixing the alarm cause, you can select *Acknowledge* to turn the alarm off using the **(✓)**. The alarm will then be acknowledged and the red alarm LED will flash now.

In the *Main menu* all main measurements and important functions are shown together with their current status. The character behind each line is an indication of how this part functions.

The following characters can be seen:

Character	Description
.	No alarms, all OK
V	Prealarm
A	Alarm
A	Alarm is turned off
M	Manual operation
X	Not present or maintenance mode
C	Pollution alarm is turned off
C	Cell is polluted

No alarms (.)
The measurement is within alarm boundaries. No alarms are present. See *figure 12.1.1*.

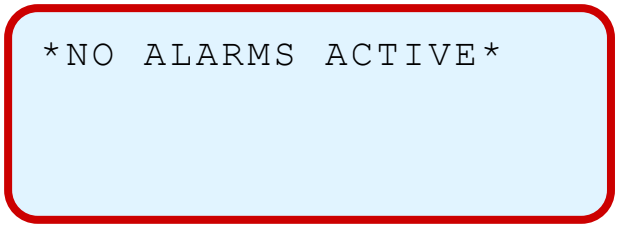


Figure 12.1.1.

Pre alarm (v)
The measurement is outside of one of the alarm boundaries. A pre alarm is being made. If there are any alarm delays set, these will start counting now. If the measurement will go in the alarm boundaries again, the pre alarm disappears. The alarm delays can be set in the menu *Settings.*

Alarm (A)
The measurement has reached outside of the alarm boundaries and does not fall back into the safe zone while the alarm delay has expired. An alarm is made and the red status LED will light up. You can check this alarm in the menu *Alarms* and a report is made.

Turned off alarm (a)
The alarm has been seen by the user, and he has turned it off by *acknowledging.* This way he notifies others that the alarm is being worked on. The red LED will flash.

Manual operation (M)
The measurement or parts is being manually controlled. This character can also be seen behind the flow measurement. In this case, the flow protection is turned off. More about this in chapter 13.

Not present or maintenance mode (X)
This character indicates the measurement is not present on the SPI and has been turned off. It can also mean the user is making maintenance on this part.

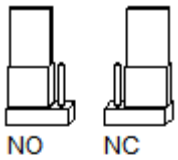
Cell pollution is turned off (c)
The measuring cell is becoming polluted and the zero water measurements are getting low. The cell needs to be cleaned.

Cell is polluted (C)
The measuring cell has become polluted on a level where it affects the measurements, the cell needs to be cleaned as soon as possible.

12.2 Alarm contact

The SPI-P170 contains an alarm contact. This is a potential free contact that can be used to transmit the alarm signals to equipment of third parties. The alarm contact is closed when an alarm is being detected on the SPI.

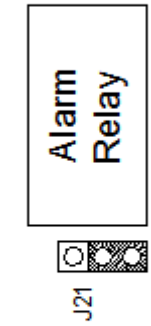
You can connect the alarm contact from the SPI-P170 to an alarm centre for example. See *figure 5.2.1* from chapter 5.2 for the location of this contact.



You are able to change the relay function to normally open (NO) or normally closes (NC) using jumper 21 on the circuit board.

For more information about connecting and setting of the jumper settings.

The contact is adjustable to a night mode. This means that when set to night mode, the alarm contact will not work in nighttimes. See chapter 16.1



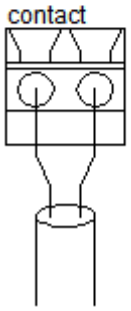


Figure 12.2.1.

12.3 Solving alarms

With correct use and regular maintenance, the least hardware errors will occur. For maintenance, see chapter 15.

For solving problems you follow the following steps:

1. Check the problem, you can do this by selecting *Alarms* from the main menu. You are able to see the active alarm here. If you or someone else has already acknowledged the alarm, you can read this back in the *Alarm* reports. For more information about this, see chapter 14.
2. Research the alarm with below list. Check if the alarm code matches, and try the solutions mentioned.

Alarm	Solution(s)
A01: H_2O_2 HIGH	-Pump settings -Wrong settings -Wrong calibration
A02: H_2O_2 LOW	-Pump settings -Wrong settings -Hydrogen Peroxide tank empty -Defect in the Hydrogen Peroxide supply -Wrong calibration
A03: pH HIGH	-Pump settings -Wrong controller settings -Acid tank empty -Defect in the acid supply
A04: pH LOW	-Pump failure -Wrong settings
A05: LOW FLOW	-Pump settings -Flowmeter defect -Defect in the sample water supply -Wrong flow settings
A06: CHECK CELL	-Starting cell contamination -Cell is dirty
A07: CELL FAILURE	-Cell is dirty -Sample water supply defect -Peroxide reagent valve is leaking in the cell -Cell is defect
A08: CRITICAL FLOW	-Pump settings -Flowmeter defect -Defect in the watersupply -Wrong flow settings
A09: ACID PUMP	-Pump settings -Acid tank empty -Defect in the acid supply -pH electrode defect
A10: H_2O_2 PUMP	-Pump failure -Hydrogen Peroxide tank empty -Defect in the Hydrogen Peroxide supply
A11: CIRCULATION	-Pump is OFF -Pump defect
A12: H_2O_2 CRIT.	-Pump settings -Wrong controller settings -Hydrogen Peroxide tank empty -Defect in the Hydrogen Peroxide supply
A13: FILTER DIRTY	-Filter dirty

Example
On the keypad, the red LED is lighting up. The alarm "*A09: pH PUMP*" is shown on the *Alarm* menu. This alarm means that the pump has been at full power for over a course of <1800> seconds (this time is adjustable), and the pH value is still high. This indicated a problem with the dosing. 3 possible solutions are:

- Pump error
- Acid tank empty
- Defect in the acid supply

1. First, check whether or not the pump is still working. Maybe the pump is turned off, or has a power failure.
2. Second, check if the acid supply tank is empty.
3. Third, you should check whether or not the transport from the acid might be defect. There could be a leak.

See **enclosure A** for a more detailed list of alarm information and their solutions.

12.4 Hot start

When the SPI-P170 has a power failure, or someone removed the adapter from the power outlet, the SPI turns off. The system contains a battery, which keeps the clock set, and if the power comes back on, the SPI will still contain the same settings as before
The temporarily turning off of the SPI-P170 with data preservation, is called the **hot start**
As the unit is commissioned for a longer period of time, the battery ages. This is causing the SPI no longer retaining the clock settings. As soon as this seems to be the fact, we advise you to take steps to replace the battery. Information about this is available with your supplier.

12.5 Cold start

In extreme cases you must move on to a **cold start**.

A cold start means a complete reset of the SPI-P170 to its factory settings. The default settings are being loaded in the machine. Your own settings need to be saved again. It is therefore advisable to first note down these settings before proceeding.

Follow the below steps to perform a cold start:

1. Take the power supply adapter out of the power outlet;
2. Press the **(✕)** button, and keep it pressed;
3. Put the power supply adapter back in the power outlet, wait until the screen's backlight lights up, then release the **(✕)** button.
4. The normal boot screen like *figure 12.3.1.1* appears, and the line 'READING ROM' flashes.

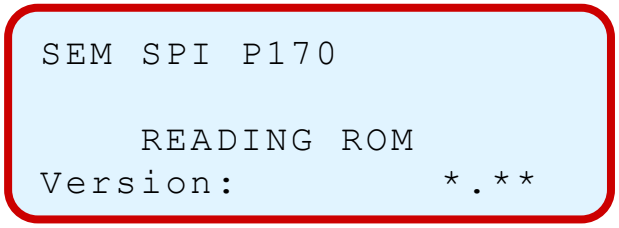


Figure 12.3.1.1.

13.Manual operation

The SPI-P170 contains the possibility to let the user control the Hydrogen Peroxide or the acid pumps on manual or semi-automatic mode. When you select *Manual operation* from the main menu, the screen as *figure 13.1* appears.

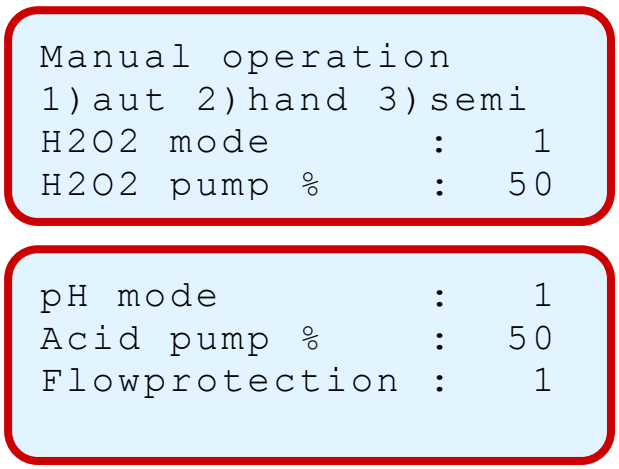


Figure 13.1.

Please note that when using manual mode to control your pumps, you should check the quality of the water yourself regularly.

13.1 Modes and settings

The SPI has a total of 3 control modes:

1. Automatic (default)
2. Manual
3. Semi-automatic

Automatic mode
In the automatic mode, the SPI-P170 controls the dosing of chemicals by the measured values. Interference of the user is not necessary.

Manual mode
In the manual mode, the user controls the dosing of chemicals by settings made by hand. This might be useful when a problem has occurred, or no measurements can be done. The “M” is shown behind the pump signal in the overview menu

Semi-automatic mode
In the semi-automatic mode, the user controls the dosing of chemicals by hand. But when the setpoint is reached, the automatic controller overrides the semi-automatic mode and the SPI continues as an automatic system. The “S” is shown behind the pump signal in the overview menu

When the manual or semi-automatic mode is active, the orange status LED will light up on the keypad.

Setting mode
The set the right mode for a pump, you select the mode of that specific pump, and press enter **(↵)**. You can fill in the following values for each mode:

1. Automatic
2. Manual
3. Semi-automatic

Confirm with **(✓)**.

Setting pulses
The following settings are for setting the correct pump capacity in percent.
For example, you have a pump with a capacity of a maximum of 120 pulses. Maximum pumping is 100%. When you set the *Hydrogen peroxide/pH pump %* at 80% now, the pump will use 80% of those 120 pulses. This means the pump will use 96 pulses at 80%. Filling in the max pump capacity in pulses will be explained in chapter 15.

13.1 Flow protection

Optionally, you can turn on (1) or turn off (0) the *flow protection*. The flow protection makes sure the Hydrogen Peroxide and acid pump will not work when the flow is low or not present at all. When you turn the flow protection off (0), the *Overview* menu will show an M (Manual) behind the flow reading.

14.Reports

When you select *Reports* from the main menu the screen as *figure 14.1* appears. In this menu you can read back and check various reports such as:

1. Alarm reports
2. Calibration reports
3. Maintenance services reports
4. Data log reports

see *figure 14.1*.

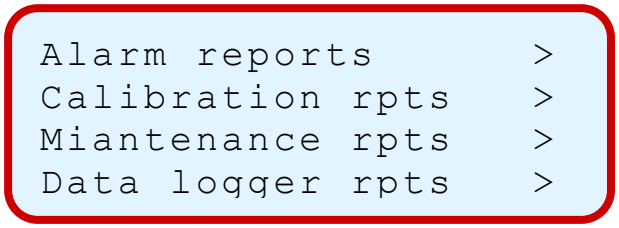


Figure 14.1.

14.1 Alarm reports

When you select *Alarm reports* from the previous menu, the screen as in *figure 14.1.1* appears. In this screen you can see all logged alarms. The first log you see is the most recent.

The log screen consists of a date and time, followed by an alarm code and description. When this alarm was acknowledged before, the final line shows whether or not the alarm was acknowledged.

When you want to browse back, you press the **(▲)** button. When you want to start at the end of the list, you press the **(▼)** button.

The following alarms logs can be seen (see chapter 12.3 for more details):

Alarm	Description
A01: H_2O_2 HIGH	Hydrogen Peroxide max exceeded
A02: H_2O_2 LOW	Hydrogen Peroxide min undershot
A03: pH HIGH	pH max exceeded
A04: pH LOW	pH min undershot
A05: LOW FLOW	Flow low
A06: CHECK CELL	Zero measurement value low
A07: CELL FAILURE	Zero measurement value very low
A08: CRITICAL FLOW	Flow very low
A09: pH PUMP	Defect in acid supply
A10: H_2O_2 PUMP	Defect in Hydrogen Peroxide supply
A11: CIRCULATION	No circulation
A12: H_2O_2 CRIT	Hydrogen Peroxide very low
A13: FILTER DIRTY	Filters are polluted

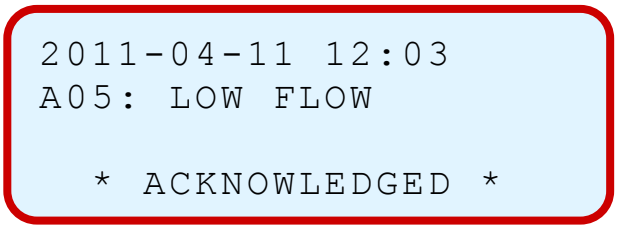


Figure 14.1.1.

14.2 Calibration reports

When you select *Calibration reports* from the previous menu, the screen as in *figure 14.2.1* appears. In this screen you can see all logged calibrations. The first log you see is the most recent.

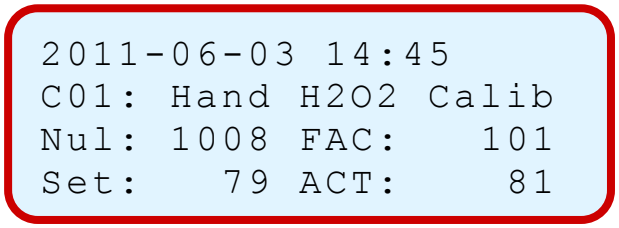


Figure 14.2.1.

The log screen consists of a date and time, followed by a calibration code and description. Also some details of the specific calibration.

When you want to browse back, you press the **(▲)** button. When you want to start at the end of the list, you press the **(▼)** button.

The following calibration logs can be seen:

Calibration	Description
C01: Hand H_2O_2 Calib	Hydrogen Peroxide hand calibration
C02: Fluids H_2O_2 Cal	Hydrogen Peroxide fluid calibration
C03: Cell Calibr.	Zero water calibration
C04: Cal. override	Calibration overridden
C05: Reset H_2O_2 Cal	Reset calibration factors Hydrogen Peroxide
C06: pH Calibration	Calibration pH
C07: Reset pH Calibr	Reset calibration factors pH

Reading the calibration report

Under the time and calibration code are the following values:

1. NUL (zero value of the measuring water)
2. FAC (calibration factor)
3. SET (calibrated value)
4. ACT (current value)

The FAC is a factor that represents the current measurement calibration, and how it differs from the previous calibration. It indicates whether the calibration is adjusted up (>100) or down (<100). The default value is 100, when no calibrations are made.

When a calibration is done, the current value is measured: the ACT. After that, you are asked to fill in the hand measured value: the SET.

14.3 Maintenance reports

When you select *Maintenance reports* from the previous menu, the screen as in *figure 14.3.1* appears. In this screen you can see all logged maintenance services. The first log you see is the most recent.
The log screen consists of a date and time, followed by a system code and description. Also some details of the specific system message.

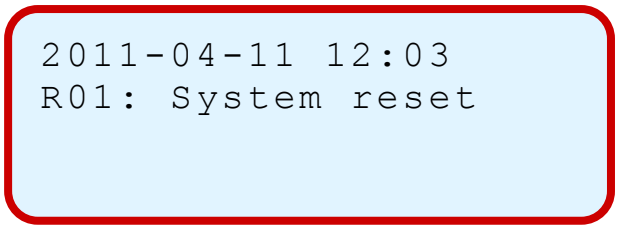


Figure 14.3.1.

When you want to browse back, you press the**(▲)** button. When you want to start at the end of the list, you press the **(▼)** button.

The following maintenance logs can be seen:

Event	Description
R01: System reset	System reset “hot start”
R02: Cold start	System reset “cold start”
R03: Maint started	Maintance started
R04: Maint stopped	Maintenance stopped
R05: Maint timeout	Maintenance timed out
R06: Software reset	Software reset

14.4 Data log repors

When you select *Data log reports* from the previous menu, the screen as in *figure 14.4.1* appears. In this screen you can see all logged data from the readings of that moment. The first log you see is the most recent.

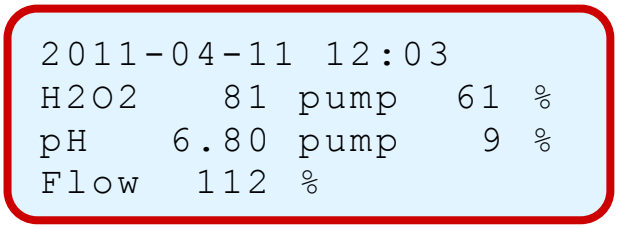


Figure 14.4.1.

The log screen consists of a date and time, followed by a system code and description. Also the following details on the moment of logging:

- The Hydrogen Peroxide value in PPM
- The Hydrogen Peroxide pump action in %
- The pH value in %
- The acid pump action in %
- The flow value in %

When you want to browse back, you press the**(▲)** button. When you want to start at the end of the list, you press the **(▼)** button.
The data logger registers every once in a while the value of the previously mentioned values and pump actions. The time between every log is adjustable. This *Log period* can be changed under *System setup*. For more information about this we link you to chapter 16.

15.Maintenance

Whenever maintenance needs to take place on the SPI-unit, and you need to detach/replace critical parts, you can start a maintenance session in the menu *Maintenance* from the main menu as seen in *figure 15.1*.

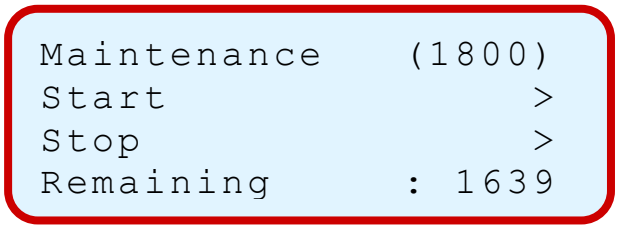


Figure 15.1.

To perform maintenance, select *Start* and press enter(↵). Now the maintenance timer will start counting. You get a standard time of 1800 seconds or 30 minutes to do your maintenance. During this time, the SPI won't send out alarms

15.1 Regular maintenance

For correct operating of the SPI-P170 it is important to regularly check on the correct operation of the unit, and keeping everything clean. This implies:

- Cleaning and keeping dry
- Checking the valves
- Checking the measuring cell for pollution
- Regularly checking the cell on the correct zero measurement
- Calibrating when necessary
- Rinsing
- Replacing bad or broken parts

Cleaning and keeping dry

1. Keep the unit clean and dry. Clean up spilled peroxide reagent or measuring water directly with a clean piece of cloth and dry.
2. Make sure no fluids are on the outside of the SPI-unit or analysis-unit.
   Check the inside of the SPI-unit for possible water or moisture

Checking the valves on correct operation

One of the most important parts of the SPI-P170 are the valves that regulate the supply and drain of measuring water and chemicals.
Because of the intensive use of these valves they need to be checked routinely on their operation:

1. The water supply valve can be checked by confirming the following:
   - Sufficient cell filling capacity
2. The cell drain valve can be checked by confirming the following:
   - Sufficient draining capability
3. The peroxide reagent valve can be checked by confirming the following:
   - A relatively short reagent opening time from the valve when the reagent vial is full (You can check this in *Cell values,* see chapter 10.1.4.1)
   - Stable use of reagent
   - The sample water has a yellow color while measuring

Checking the measuring cell on pollution
The measuring cell can be checked on pollution by checking the zero water value. Normal water should have a zero value of around 1000. But whenever pollution in the cell is occurring, the less light from the LED reaches the receiver. The measurement is then affected. Check chapter 16.3.1 for more information. You can check the current zero value of the measurement in *Cell setup* under *Configuration*. See chapter 16 for this. When pollution is occurring, you can clean the cell with acrylic polishing paste.

Adjusting zero value to 1000
Like mentioned before, the zero value is at best when the value is measured at or around 1000. After a while when light pollution obstructs the flow of light in the cell, this value can differ. The zero value must be calibrated back to 1000. See chapter 16.3.2 for this.

Calibration
Every once in a while we advise to check the measurements for abnormalities, and when necessary, to calibrate them. When this is the case, calibrate the measurements of the SPI-P170 with well calibrated equipment of third parties. More about calibrating is described in chapter 10.

Rinsing
Rinse the analysis-unit thoroughly at major maintenance with clean water. This will clean out particles that might have come through the filter in the buffer jar.

Replacing parts
Replace broken of bad performing parts where necessary with new parts. Contact your supplier when in doubt.

15.1.1 Maintenance instruction of valves

For a proper operation of the valves it is important to follow these instructions well.
The valves are not supposed to dry with water, reagent, or other fluids containing chemical components. If you want to store the SPI-unit for a longer period, please follow the instructions as described in *chapter 4.1*.

The valves may never be opened.
The screws in these valves are tightened with a torque driver, and these valves perform less when these screws are tightened too firm or too loose. They could then stop fluid from getting through, or even leaking. Opening the valves voids the warranty.

! Please note! The valves on the cell are sensitive equipment. We cannot guarantee the warranty if you maintain these yourself, so send them back when they seem defect.

16. Configuration

When you select *Configuration* from the main menu, the screen as *figure 16.1* appears. With the help of this menu you can check and change various settings used for the configuration of your SPI system.

The menu contains the following options:

1. System setup
2. Version info
3. Cell setup
4. Language
5. System reset
6. mA card

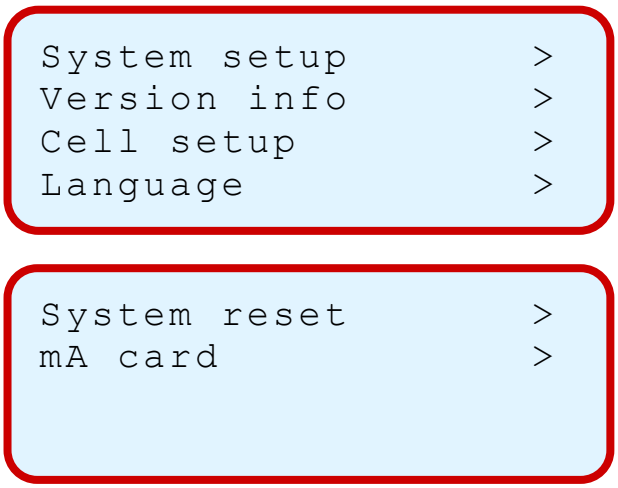


Figure 16.1

16.1 System setup

When you chose for *System setup* in the *Configuration* menu, the screen as in *figure 16.1.1* appears. In the system setup menu it is possible to view and modify settings involving system setup and connected parts of the SPI-P170.
You can find the following options in this menu:

1. *Has H2O2* (Set if your system does (1) or does not (0) make use of the Hydrogen Peroxide reading)
2. *Has pH* (Set if your system does (1) or does not (0) make use of the pH reading)
3. *Flow type* (Set the flowsensor type to Not connected (0), Pulse sending (1) or current sending (2))

```
Has H2O2        :    1
Has pH          :    1
0)nc 1)pulse 2)mA
Flow type       :    1
```

Figure 16.1.1.

4. *H2O2 pump p/m* (Fill in the maximum amount of pulses of your Hydrogen Peroxide pump)
5. *Acid pump p/m* (Fill in the maximum amount of pulses of your acid pump)
6. *Extern contact* (Set if you want to be able to connect the SPI to the internet (1) or not (0))
7. *Log period* (Set the time in seconds the SPI system waits before creating a new log report)

(to be continued on next page)

```
H2O2 pump  p/m:  120
Acid pump  p/m:  120
Extern contact:    1
Log periode    :  180
```

Figure 16.1.1.

8. *m3/h at 30Hz* (Set the amount of cubic litres of water each hour when the flowmeter sends out pulses of 30Hz. Only valid when you chose a flow type with pulse output. See chapter 11.3.1)
9. *m3/h at 100%* (Set the amount of cubic litres of water each hour when the flow is 100% This information should be supplied with the design plan by the installer)
10. *m3/h at 20mA* (Set the amount of cubic litres of water each hour when the flowmeter sends out 20mA. Only valid when you chose a flow type with current output. See chapter 11.3.1)
11. *Cell contamination* (Set the minimum zero measurement at which an alarm should be given to identify starting pollution of the cell, a small 'v' then appears behind *Overview* in the overview menu)

```
m3/h at 30Hz   :   50
m3/h at 100%   :  100
m3/h at 20mA   :  100
Cell contam.   :  800
```

Figure 16.1.1.

12. *Cell dirty* (Set the minimum zero measurement at which an alarm should be given to identify complete pollution of the cell, a capital 'C' then appears behind *Overview* in the overview menu)
13. *Cell alarm delay* (Set the time in seconds the system delays the alarm of starting and complete pollution)
14. *System ID* (Set a custom identification number to this SPI for recognition. The numbers 1 – 254 can be used)
15. *Alarm at night* (Set here if you want alarms to be activated at night (1) or not (0))

```
Cell dirty     :  600
Cell alarm del:  900
System ID      :  123
Alarm at night:    1
```

Figure 16.1.1.

16. *pH mode* (Set here if you'd like to use either acid (0) or lye (1) to control the pH of the water, the pH controls wil be reversed then)
17. *Min rea valve* (The color valve start at 0,05 sec)
18. *Beep On/Off* (Yes or no sound when there is circulation)

```
0)acid 1)lye
pH mode        :    0
Min rea valve  :    5
Beep On/Off    :    1
```

Figure 16.1.1.

16.2 Version info

When you chose for *Version info* in the *Configuration* menu, the screen as in *figure 16.2.1* appears. In the version information menu it is possible to view the following information:

1. Software (the current version of the SPI-P170 Hydrogen Peroxide software)
2. System ID (Your custom system ID of this SPI model)

You can use this information if the supplier asks for this for technical assistance.

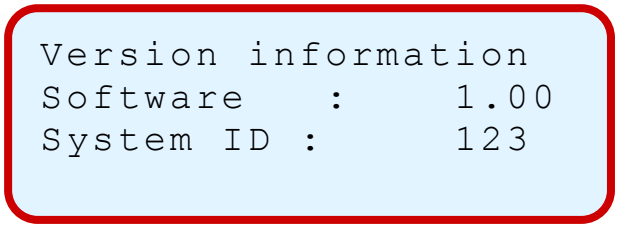


Figure 16.2.1

16.3 Cell setup

When you chose for *Cell setup* in the *Configuration* menu, the screen as in *figure 16.3.1* appears. In the cell setup menu are a few settings and options relative to the measuring cell. You can also calibrate the zero value of measuring water here. This indicates that you set the default value of the zero water measurement at 1000.
You can find the following settings and options in this menu:

1. *LED current mA* (the amount of milliamps sent through the LED when measuring, only change on advise of the supplier)
2. *Cell value* (the current amount generated by the receiver)
3. *Adjust to 1000, press (V) to save* (calibrating the zero measurement, execute this a few seconds after the LED has dimmed)

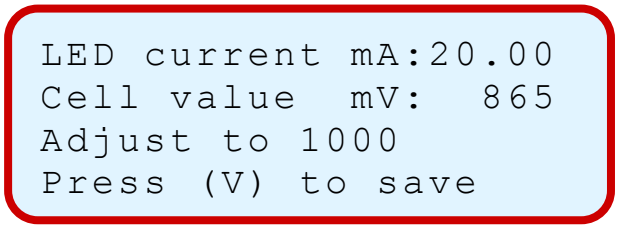


Figure 16.3.1.

4. *Supply valve* (activate the supply valve)
5. *Drain valve* (activate the drain valve)
6. *Color valve* (activate the color valve)
7. *Remeasure* (start measuring)

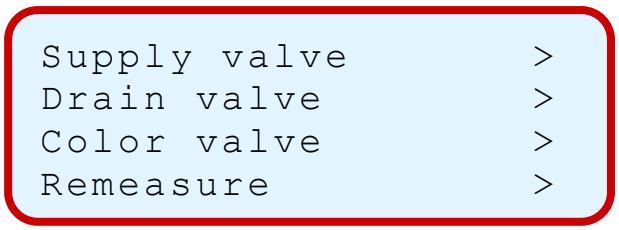


Figure 16.3.1.

16.3.1 Principle of the measurement

The cell consists of:

- A LED (Light Emitting Diode) (sender)
- A transparent hollow chamber (the cell)
- A Photodiode (receiver)

See *figure 16.3.1.1*.

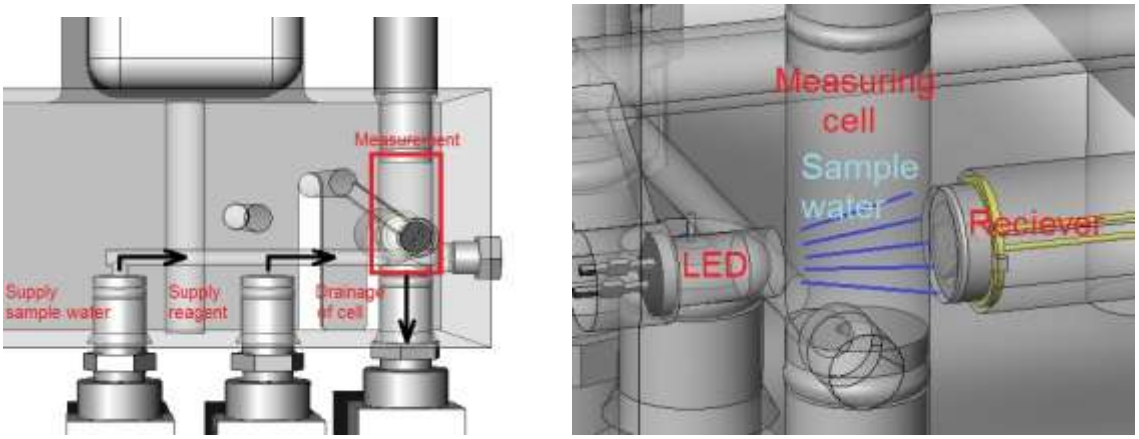


Figure 16.3.1.1.

A current is sent through the LED, and it will light up. This light falls through the chamber's walls, through the water, on the photodiode. Because of the so-called photovoltaic effect, a small voltage is generated in the photodiode. This voltage is measured by the SPI-P170 and converted in an internal value.

The amount of Hydrogen Peroxide in the measuring water is determined by adding a small dose of peroxide color, that reacts with the Hydrogen Peroxide and causes the water to discolor to a slight yellow color, hence the name *reagent*. The more discoloration, the more Hydrogen Peroxide is present in the sample water.

Because of the discoloration, the water will get more dark, and absorb more light. When this happens, less light will fall on the receiver, resulting in less voltage. The SPI will measure this change. A measurement without peroxide color should give an internal value of around 1000. A good measurement with peroxide color added will be much lower.

16.3.2 Calibrating zero value

When the zero value starts to differ a lot from the normal value of 1000, it is important to check if the cell is clean. If the cell is clean, the cell might need to be calibrated. Calibrating implies that the zero value must be set back to its default value of 1000.
To calibrate the cell, follow below steps:

1. Check for serious zero value difference (lower then 800) You can do this by pressing *Remeasure* and checking *Cell value* (Main menu->Configuration->Cell setup)
2. If there is deviation, go to the *Cell setup* menu.
3. For using the valves go down.
4. Rinse the cell a few times, select *Supply valve* and press **(↵)**.Do the same with the *Drain valve* and repeat this.
5. If the cell is rinsed, activate the supply valve once more, select Remeasure and press **(↵)**.
6. The screen now shows the top screen again and the cell will measure the water. You can see the value of this water in *Cell value.* This measurement can take 15-20 seconds.
7. If the measurement shows a value 800-1000), you press the tick **(✓)** button to accept the calibration. See *figure 16.3.2.1.* If the value is lower, clean the cell first, and try again. Otherwise, contact your supplier.
8. The cell is now calibrated.

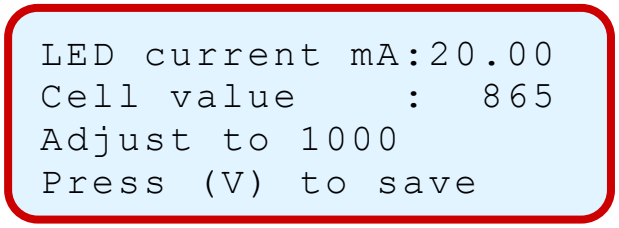


Figure 16.3.2.1

16.4 Language

The SPI-P170 contains a language menu where you can select the language of your prefered choice. When you choose *Language* in the configuration menu, you see the screen as *figure 16.4.1.* You can make a choice out of 2 languages:

- English (0)
- Dutch (1)

The default language will be in English. To change this setting, go from the main menu to *Configuration*, then to *Language* and there you select language and press enter **(↵)**. Fill in 0 for English, and 1 for Dutch. Press (✓) to accept.

```
Set language
0)EN 1)NL

Language      :    1
```

Figure 16.4.1.

16.5 System reset

The SPI-P170 contains an option to reset the system using the screen instead of taking out the adapter out of the socket. This way, you can reset the SPI using the SPI-REMOTE software. When you choose *System reset* in the configuration menu, you see the screen as *figure 16.5.1.* If you press (✓) in this menu, the SPI-P170 will be reset using the hot start method.

```
System reset
Press (V) to reset
```

Figure 16.5.1

16.6 mA card

The analog module is a module for the SPI. The SPI can be extended with 4 analog outputs.

- Current chlorine value
- Current pH value
- Chlorine pump action
- Acid pump action

This analog outputs are adjustable for: 0-10V/2-10V/0-20mA/4-20mA
This allows the SPI to be hung any PLC or building management system.

17. Decommissioning

If you'd like to decommission the SPI-P170 for (longer) periods, follow the below procedure:

1. Remove the adapter from the power outlet.
2. Remove the peroxide color vial from the holder an rinse the tube with clean water. (please take the necessary safety precautions).
3. Close the vial with the original cap without holes.
4. Empty the buffer jar with the tap underneath it.
5. Flush all components using clean water and dry these as well a possible.
6. Disassemble all cables and tubes to the SPI.
7. Before taking the assembly off the wall, we once again point out that everything must be dry by now.
8. Take the assembly off the wall and follow the storage instructions from chapter 4.

18. Discarding

The SPI-P170 contains electronic components. Inform to the possibilities to separate and recycle these components during discarding.

Remove possible chemical remains like Hydrogen Peroxide or the corresponding peroxide color and discard these as chemical waste.

When in doubt, contact your supplier. They are able to serve you with advise.

Notes

Notes